

National Science Foundation
Directorate for Biological Sciences

BIO Advisory Committee
Boulder CO
October 6-7, 2010

Summary Minutes

Wednesday, October 6, 2010

Hotel Boulderado

Welcome and Approval of Minutes

Dr. Barbara Schaal, Chair of the Advisory Committee for the Directorate for Biological Sciences (BIO AC) welcomed everyone and asked the participants of the meeting to introduce themselves. The minutes from the spring 2010 BIO AC meeting were approved unanimously.

NOTE: Drs. Sue Bryant, Robert Hazen, Richard McCombie, Eva Pell, Muriel Poston and David Prior did not attend or otherwise participate in this meeting. Dr. David Stern did not attend but participated by teleconference.

Welcome/Update – Dr. Joann Roskoski, Assistant Director (Acting), Directorate for Biological Sciences (BIO)

Dr. Roskoski presented an NSF staffing update that included: Dr. Subra Suresh, NSF Director; Dr. Peter Arzberger Assistant Director (Acting), Directorate for Computer and Information Science & Engineering (CISE); Dr. Machi Dilworth, Deputy Assistant Director (Acting), Directorate for Math and Physical Sciences (MPS); Dr. John Wingfield, Division Director, Division of Integrated Organismal Systems (IOS); Dr. Judy Verbeke, Division Director (Acting), Division of Biological Infrastructure (DBI); and Dr. Jane Silverthorne, Deputy Division Director, IOS. Dr. Roskoski also noted that the position of Assistant Director for BIO was still unfilled following Dr. James Collins departure in October 2009.

After briefly reviewing the “Sensational 60 Years” of NSF and BIO, Dr. Roskoski described the Administration’s priorities including the Open Government Directive, which requires agencies to publish government information online, improve quality of information, institutionalize a culture of openness, and create a framework to support this. Dr. Roskoski provided details about the NSF Open Government Website including OMB guidance on the use of challenges and prizes to promote open government and innovation (www.challenge.gov). She solicited the assistance of the BIO AC to determine what datasets NSF should make available and what topics or areas would be amenable to the use of challenges/prizes. Dr. Roskoski also reported the status of the FY 2011 Budget Request which is an increase of 7.5% over the FY 2010 budget, as well as BIO priorities for 2011.

The BIO AC discussed the sometimes lack of clear guidance, language, and requirements given to the community by the NSF, especially with regard to the new requirement for a data

management plan in proposals submitted after January 17, 2011. Concern was expressed about unrealistic expectations for PIs and the NSF to be responsible for the storage and availability of data generated with federal funds. The BIO AC discussed what is needed in the scientific community to maintain data and ensure its continual availability, the relationship between NSF and data.gov, data management (standards, formats, and platforms), and software institutes. Questions were also raised regarding evaluation of data management plans during the review process.

Innovation Experiments – Dr. Joanne Tornow, BIO Executive Officer (Acting) and Director, Office of Emerging Frontiers (EF)

Dr. Tornow provided an overview of the innovation experiments the purpose of which is to examine innovative new ways to review and identify potentially transformative, including high risk, interdisciplinary projects. BIO invested \$18.5M in innovation experiments in FY 2010.

Ideas Lab – Dr. Joanne Tornow, Director, Office of Emerging Frontiers

Dr. Tornow reported the Ideas Lab experiment was adapted from the “sandpit” concept developed by the Engineering and Physical Sciences Research Council in the United Kingdom. The Ideas Lab approach identifies a grand challenge topic or problem for a competitively selected interdisciplinary group of people to address. The group is expected to use creative new ways of thinking to address these challenges and the 5 day meeting is professionally facilitated.

The Ideas Lab, *Innovations in Biological Imaging and Visualization* was held in May 2010:

- A panel of external mentors and responsible NSF senior managers selected 25 participants from among 160 applicants.
- The Ideas Lab generated 7 potential projects involving multiple participants. Five project groups were invited to submit full proposals which were reviewed by the Mentor group, and 3 projects funded: Biological Shape Spaces: Transforming Shape into Knowledge, Q Storm: Switchable Quantum Dots and Adaptive Optics for Super-reduction Imaging, and ImageQuest: Citizens Advancing Biology with Calibrated Imaging and Validated Analysis.

The Ideas Lab, *Surpassing Evolution: Transformative Approaches to Enhance the Efficiency of Photosynthesis* Ideas Lab was held in September 2010. This Ideas Lab was collaboration between the Biology Directorate (Division of Molecular and Cellular Biosciences and Division of Integrated Organismal Systems) and Biotechnology and Biological Sciences Research Council in the UK.

- This Ideas Lab generated 8 potential projects involving multiple participants, four of which have been invited to submit full proposals for review by the Mentor group. The solicitation for this Ideas Lab also invited regular proposals in the same area from the community for comparison with the projects developed using the Ideas Lab format.

“Tools Wiki” – Dr. Jane Silverthorne, Deputy Division Director (DDD), Division of Integrated Organismal Systems (IOS)

Dr. Silverthorne briefed the BIO AC on the “Tools” wiki innovation experiment. A Dear Colleague Letter was issued encouraging connection and collaboration of tools developers with potential end-users through the wiki site. The goal of the Tools Wiki was to foster better communication to address current IOS gaps and needs for research tools and to stimulate innovative ideas and approaches. 552 investigators and developers registered on the wiki site and 57 projects were explored. Forty proposal inquiries were received of which 25 were encouraged to submit proposals. Twenty full proposals were received of which 9 problem-driven projects were funded (\$2.6M). Dr. Silverthorne also described a few of the awards as well as the strengths and weaknesses of the wiki process.

“Big Pitch” – Dr. Parag Chitnis, DDD, Division of Molecular and Cellular Biosciences (MCB)

Dr. Chitnis described the “Big Pitch” innovation activity that attempts to address whether panels would be receptive to the merit review of 2-page “big pitch” synopsis proposals emphasizing “big questions” compared to full-length proposals. Fifty proposals related to climate change were selected for this experiment and the PIs were each asked to also submit a 2 page synopsis of his/her proposal. The full proposals were independently reviewed in regular panels to insure that no disadvantage accrued to the PIs participating in this experiment. In addition, two special panels independently reviewed either the full proposals or the related 2-page versions. None of the panels was aware of the results from the others. Seven projects were funded through the regular panels and seven projects were funded through special panels (\$4.6M). Dr. Chitnis presented the qualitative conclusions of the “big pitch” experiment, the analysis yet to be done, and the next steps required to further evaluate the 2-page synopsis proposal as an alternative to the traditional full proposal.

Grade-Free Panel – Dr. Bette Loiselle, Division Director (DD), Division of Environmental Biology (DEB)

Dr. Loiselle presented the results of the “grade-free panel” that attempted to address the question “Does the use of the scores and panel recommendations influence the perceived intrinsic worth of proposals?” She noted that some believe the current review process favors a “conservative” outcome and noted a few of the aspects of the process that may foster conservatism. In this experiment, a subset of 30 proposals submitted to Dimensions in Biodiversity program was reviewed by panelists simply on the basis of strengths and weaknesses and without a consensus recommendation. The rankings of the grade-free panel closely matched rankings given independently by regular panels and Program Directors; indeed, both panels largely agreed on the top ranked and bottom ranked proposals. The top 2 proposals were funded. Dr. Loiselle noted that the grade-free panelists were more engaged in the review process, participated more in discussions and felt relieved to not have to argue about where the proposals go in the overall rankings. The main problem with this experiment was the small sample size.

The BIO AC discussion of the innovation activities began with three questions: were the same proposals run through the different innovation experiments; was the Statistics Program involved; and were truly novel ideas generated. The presenters addressed those questions as they pertained to each innovation activity. Going into FY 2011, the staff was asked to think about areas to be explored and what could benefit from these methodologies. Dr. Tornow described plans to survey panelists about the value of ad hoc reviews during the fall /winter panels. Asked

whether NSF is looking to implement a radical change in the review process, Dr. Roskoski said the review process works, but the proposal volume is very large and growing (which led to a discussion of workload issues). It was stated that the goal of the experiments is not to replace what is done but rather to provide more options. With the exception of the grade-free panel, the experiments will be run a few more times to determine their robustness identify weaknesses and make appropriated adjustments.

Three suggestions from the BIO AC were:

- Measure how the proposals fair after a few years, retrospectively. How did proposals that were funded but ranked in the middle fair at the end? Did they produce something exciting? If possible, correlate the scores of the outcomes.
- For the merit review of the proposals that are not scored, ask the PIs to do self evaluations and provide their own summaries of the strengths and weaknesses.
- Possibly consider giving PIs a chance to respond to criticisms (similar to EHR).

Research Resources

Background – Dr. Charles Liarakos, Policy Advisor, BIO/OAD

Dr. Liarakos reviewed the discussion of the last Advisory Committee meeting to investigate the possibility of the AC predicting resources needed for the future. After researching and capturing the published reports on biological resource needs, it was decided there is no need to generate yet another report reproducing what is already in existing reports. Dr. Liarakos noted that the Directorate thought that the community was better served by investing in resources that were supportive of and were in conjunction with research programs such as Digitization of Biological Collections and Dimensions in Biology.

Digitization of Biological Collections – Drs. Mike Donoghue and Mike Mares, BIO AC

Drs. Donoghue and Mares reported on the progress of the digitization of biological collections. In May 2010 a strategic plan for digitization was developed and used for a new call for proposals. The strategic plan recommended the development of the National Digitization Hub Unifying Bio-collections (ND HUB) to look at innovation and utilization, identify best practice standards and workflows. The goals of the effort include mobilizing data, entering all biological and paleontological specimens in a database with ancillary information, creating new web interfaces and new tools for data mining and making all of the data available with real-time upgrades of the data. Integration of regional and thematic collections networks is also included in the plan to organize and support the digitization efforts within a group of institutions. Advancing Digitization of Biological Collections (ADBC) was announced in August 2010. It calls for proposals for the development of 1 HUB, and 6-11 TCNs with funding in the amount of \$10M (\$2M/yr for 5 yrs). The presentation concluded with a description of the Networked Integrated Bio-collections Alliance.

The BIO AC discussion centered on storage issues, parallel efforts (national and global), integration and linkage of information available world-wide, and the problem of inconsistent methods. There was a suggestion for the development of service learning activities: course modules to engage the students in hands on science (might be a great mobilization opportunity).

Dimensions of Biodiversity – Dr. Penny Firth, DDD, DEB

Dr. Firth provided an update of the Dimensions in Biology Program activities. In FY 2010, 195 proposals were submitted including 5 joint US-China RCN proposals. Fourteen research awards and 1 joint US-China RCN were funded (\$24M) by BIO (DBI and DEB), GEO, and OPP. Dr. Firth noted that the community (panelists and PIs) was very supportive of and excited about the solicitation, and she described one of the funded projects. Dimensions of Biodiversity activities include:

- A design “charette” with a report to be issued Fall 2011;
- A CI workshop to address appropriate biodiversity information management including real-time, online reporting;
- Another workshop in November to meet with FAPESP and CNPq to discuss partnership opportunities to NSFC model;
- A winter 2011 initiation of distributed graduate seminar to assemble what is known now;
- A spring 2011 partnership meeting with NSF-China;
- Dimensions Workforce Activities, a working group focus on training the next generation of biodiversity of scientists;
- NASA/NOAA/USGS BRD partnership discussions;
- Discussions with South African and Brazilian scientists for partnership with USAID;
- NGO partnerships (Moore Fdn, Pikes Center, and NatureServe);

The BIO AC discussion that followed focused on data.gov, its usage, and the type of wikis being used.

Lunch Presentation – Dr. Nalini Nadkarni presented “Preachers, Poets, and Prisoners as Partners for Scientists in Public Outreach and Engagement: Case Studies from Forest Canopy Research.” It was suggested following Dr. Nadkarni’s talk that data should be gathered about the economic value to Broadening Impacts (BI) efforts. Dr. Burggren noted that the time devoted to BI reported by PIs ranges from 0% to 70%, and that clarification of BI and BI efforts is needed.

Science, Arts and Humanities Symposium – Drs. Chris Comer and Ellen Lovell-McCulloch, BIO AC

Drs. Comer and Lovell-McCulloch reported that a symposium proposal submitted to NSF had been reviewed, and awarded. Discussions are ongoing with NEA regarding their input and participation, including partial funding. The symposium will include approximately 25 people and is planned for the DC at a date to be determined (probably in February 2011 or possibly March or later). The Symposium will focus on interactions between life sciences and arts/humanities (with the exception of music) in an attempt to understand how the joint discovery works to open up new partnerships and generate new knowledge. Drs. Comer and Lovell-McCulloch presented many possible questions which could be addressed during the symposium. In answer to a question about the follow-up after the symposium, there was discussion of a modest dissemination plan which includes a video of the meeting, information on NEA’s website and a report to NSF. Possible outcomes and challenges of the symposium were discussed.

PGRP COV Report – Dr. David Stern, BIO AC (attempted and postponed until October 7, 2010 due to poor phone connectivity)

DBI COV Report – Dr. Jonas Almeida, BIO AC

Dr. Almeida reported two clear conclusions from the DBI COV meeting: First, Dr. Peter Arzberger had been an excellent Division Director and second, DBI provides a useful function. He then discussed the DBI response to the COV report. DBI was encouraged to take a more proactive role in promoting the use of the infrastructure it supports for scientific discovery and in communicating the transformative impact of these resources to the wider community. The balance between support and innovation was identified as critical, and the difficulty in tracking metrics was noted. The COV was impressed by the education programs in DBI's portfolio. However, a central concern identified by the COV was the difficulty of getting access to student outcome data. Dr. Almeida also stated that as Biology becomes more interdisciplinary, infrastructure may play a more central role in research and education. The last topic was the COV's perspective on the number of minority PIs, which led to a discussion of submission of proposals by minority PIs (does a problem exist?), and their funding rate. The DBI COV report was approved unanimously by the BIO AC.

COV updates

Dr. Silverthorne presented the IOS COV update. The division is responding to the major areas of the last COV report, such as review criteria, portfolio of awards, program management. The responses include providing instructions and templates to panelists, review of panel summaries, changes in the review analysis preparation, and increased outreach. The next IOS COV is scheduled for June 2011. A volunteer was requested from the BIO AC. (NOTE: Dr. David Stern subsequently volunteered to represent the BIO AC at the IOS COV meeting.)

Dr. Steven Howell, DD of MCB, talked about how MCB has addressed their last COV report. To address Broader Impact (BI) concerns, MCB in collaboration with the American Society of Biochemistry and Molecular Biology funded a focus group of PIs who had made progress in Broader Impacts (such as identifying ways to integrate research and BI, address key issues and identify problems in the community and institutions). A report was produced and will be published on the MCB website. MCB is involved with Emerging Frontiers (EF) innovation activities to address the Potentially Transformative Research issues identified by the COV. Clusters in MCB have been re-organized in order to encourage new ideas and provide clarity to the community. The dates for the next COV are March 23-25, 2011. Dr. James Siedow volunteered to represent the BIO AC during the MCB COV meeting.

Dr. Firth reported on the progress of DEB's response to the COV. Of the 31 recommendations, 22 have been/are being addressed. She described many of the responses such as the division's response to staffing- DEB is making the best case to OAD for more FTEs and has a working group to help streamline workflow. Program Directors are required to do two outreach activities a year, bringing back BI advice and the results of panel instructions regarding past BI efforts. Several other internal processes have been implemented pertaining to workflow, annual reports, establishment of a catalytic reserve, and budget incentives.

Dr. Tornow discussed efforts by the Office of Emerging Frontiers (EF) in response to the EF COV report, which emphasized broadening the reviewer base and expanding the research scope of Advancing Theory in Biology program, and the transition of EF programs into the BIO Divisions. EF will look into the development of plans to evaluate programs after the transition.

The BIO AC asked BIO DDs and DDDs if there were attempts to measure transformative research. The group discussed efforts to get the panelists to make judgments regarding potentially transformation research and to define what is considered transformative. This was followed by a general discussion of fundamental questions about broader impacts and NSF efforts to answer them.

New Ideas in BIO

Phenomes – Steve Howell, DD, MCB

Dr. Howell presented a new effort d to address the genotype/phenotype problem. A working group has been established including Program Directors from BIO, ENG, CISE, and MPS as well as representatives from other interested government agencies. Dr. Howell discussed two approaches to make the problem more tractable and the advantages and disadvantages of each. Dr. Howell's presentation was followed by a discussion with the BIO AC about differing views of the definition of phenotype, the community's efforts to date, the size and tractability of the problem, the feasibility of the approaches, the current availability of data and the knowledge base, and NSF funding for "phenomics."

Metabolomics – Jane Silverthorne, DDD, IOS

Dr. Silverthorne reported on "Metabolomics for a Low Carbon Society", a collaboration between the US and Japan. [A U.S.-Japan Joint High Level Committee (JHLC) meeting was held in June 2010.] The goal of the program is to identify all major metabolites (including specialized metabolites of potential value). Dr. Silverthorne presented the timeline of activities: A Dear Colleague Letter issued in September 2010; joint solicitation release in October 2010 with a proposal deadline of Feb 2011 and a joint panel review May 2011; a joint site visit June 2011 in Hawaii; and awards and PI meeting in Aug 2011. The anticipated duration of the awards is 3 years with the potential for 2 year extension. \$12M is budgeted for the program (\$6M from NSF and \$6M from Japan) which should cover 4 projects at \$500K/yr. It is hoped the program will lead to future NSF BIO international opportunities. Dr. Silverthorne's presentation was followed by a brief discussion with the AC of the details of the program.

Recognition of departing BIO AC members – Dr. Joanne Roskoski

Four members of the BIO AC were recognized with a certificate of appreciation and thanked for their participation: Christopher Comer, Michael Mares, Ellen McCulloch-Lovell, and Robert Robbins.

Dr. Schaal adjourned the meeting for the day.

Thursday, October 7, 2010

National Ecological Observatory Network (NEON), Inc Technical Facility

Convening of Meeting

Dr. Schaal convened the meeting upon arrival at the NEON, Inc technical facility. Introductions were made by the BIO AC, NSF staff, and NEON, Inc staff.

NEON Presentations

Tony Beasley, Chief Operating Officer, NEON Inc. presented an overview and status update for NEON. The questions from the AC that followed mainly addressed data availability, accessibility, and storage.

The BIO AC members and NSF staff toured the NEON Prototype Site at Table Mountain.

PGRP COV Report – Dr. David Stern, BIO AC

Dr. Stern via teleconference provided to the AC an overview of the PGRP COV. The PGRP is guided by 5 year plans by NPGI, making it a mission driven program.

- The most recent plan was published in 2009
- PGRP fills a unique niche that could not be filled otherwise, and does an outstanding job
- Pipeline/Education issues:
 - PGRP supports all levels of education and outreach
 - Graduate Student/Post-Doc training program will target an area that is understaffed in industry
 - Cohesive graduate student training program is needed
 - K-12 education: how is the success measured? It's difficult to evaluate if more or less should be done.
- Workload Issues:
 - A number of awards with lots of communication between PIs and PGRP Program Director to fine tune projects to fit most pressing needs and best allocate resources;
 - COV concern that there is only 1 permanent Program Director; continuity in staffing is a valuable asset
 - Triage: COV does not want to eliminate a great proposal because of triage processes
 - Workload problem are not going away
- CI issues:
 - Data storage;
 - Need for analytical tools needed to interpret the flood of new data;
 - New solicitation for tool development;
- National Academies report recommendations were discussed by the COV
- The COV noted that good biology, not just data, is coming out of the projects.

The AC members provided feedback to the COV report and the PGRP COV report was unanimously approved.

NEON Presentations and Discussions- NEON, Inc Personnel

Dr. Michael Keller, Chief Scientist, presented an overview of the science behind NEON, key NEON data, and the data products which are to be produced. Questions followed concerning forecasting responsibility, community involvement, and the design and development process.

Dr. Wendy Gram, Chief of Education and Public Engagement, provided the strategy for NEON education and public engagement and discussed with the AC members the role of the DSEECs.

Dr. Brian Johnson provided the overview of the NEON Airborne Observatory Platform (AOP) and pathfinder flights. A video detailing the capabilities of the NEON AOP was also shown. The topics of the AC discussion included leasing and cost of leasing, accuracy of the instruments, control in-flight of the instruments, the availability of time stamps, and the variability of understory composition.

The AC members and some of the NSF staff toured the ENG/Cal-Val facility.

Dr. Rebecca Kao, manager of the Fundamental Sentinel Unit, described the prototyping sampling currently being done at NEON, Inc. Sampling and partnerships and collaborations were discussed in more detail with the AC members.

Spring BIO AC Meeting

The BIO AC Spring Meeting (March 2011) was discussed and the following action items identified:

- Dr. Liarakos will send an email message asking about the meeting date;
- The next BIO AC meeting will devote ½ of the first day to BIO Directorate business, reports etc.
- The remainder of the meeting will have an open agenda to discuss topics suggested by the BIO AC, including the possibility of a ½ day with no agenda at all. One proposed topic is BIO's relationship with EHR with respect to graduate education.

Dr. Schaal adjourned the meeting.